Technical Report

Population genetics of the Brown Caiman (*Caiman crocodilus fuscus*) on Coiba

Submitted to

Crocodile Specialists Group

By.

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INTRODUCTION

Coiba Island is approximately 30 miles south of Panama in the Pacific. It consists of 431,000 hectares of tropical forest, beaches and mangrove forests. The island is approximately 30 km long, 18 km wide and the elevation can vary from 0 to 350 m above sea level. It is drained by a network of short, rapidly flowing rivers. Coiba is a relatively unexplored island that was connected to mainland Panama by a land bridge as early 10,000 years ago when sea levels were up to 200 m below present levels (Gotelli & Graves 1990). As on many islands like it, there is a lot of diversity among birds and mammals but little diversity in the herpetefauna. Reported herpetefauna include only a handful of snakes, lizards, amphibians and two crocodilian species, the American Crocodile (*Crocodylus acutus*) and the Brown Caiman (*Caiman crocodilus fuscus*).

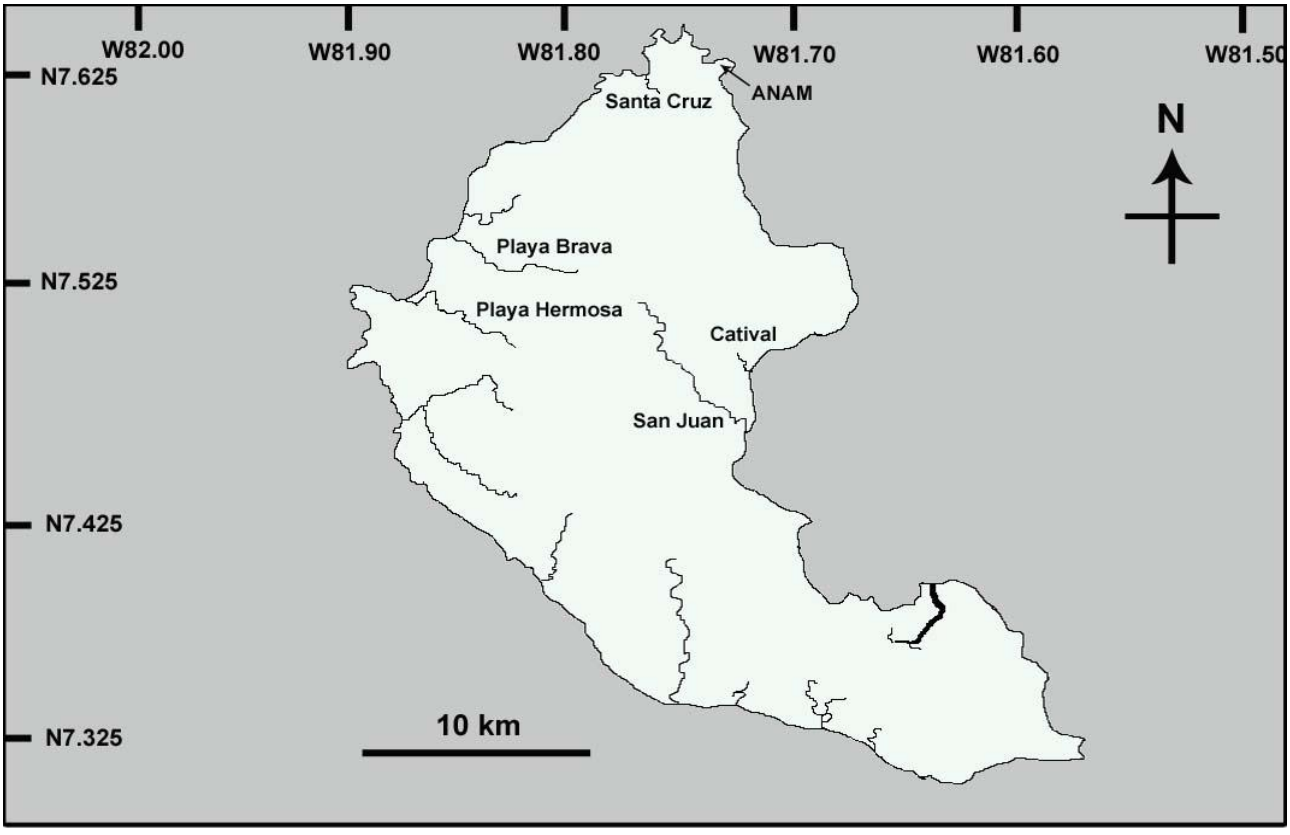
The habitat of *C. acutus* consists of mangrove-lined coastal regions as well as hyper-saline landlocked lakes and freshwater sections of rivers and reservoirs (Ernst et al. 1999). The presence of lingual salt glands in *C. acutus* makes it possible for these animals to excrete salt from the body, allowing tolerance to saline environments (Taplin et al. 1982). *Caiman crocodilus fuscus* is found in relatively freshwater environments. They prefer slow moving shallow water systems typical of swamps, but they are also inhabit inland lakes and rivers (Herron 1994). Coiba Island has a number of narrow rivers, but very few lagoons or lakes.

Reports of caiman on Coiba exist yet no physical evidence (e.g. picture, tissue or whole specimens) are available for confirmation. Before any genetic work could be undertaken it was necessary to explore and sample the island for all crocodilian species. The presence of caiman would raise some interesting questions regarding sympatry and habitat allocation with the much

larger and dominant *C. acutus*, and provide a natural laboratory to study the coexistence of these two species. It would also be interesting to study the genetic differentiation from mainland caiman to estimate the amount of time since geographic isolation and identify any possible gene flow between island and mainland caiman.

SAMPLING

From July 14th 2009 to August 1st 2009, we were accompanied by National Authority of the Environment (ANAM) rangers to explore five rivers on the west, north and east sides of the island. Surveys for evidence of crocodilian habitation were conducted at low tide during the day.



Map of Coiba Island, rivers sampled are labeled.

We move by foot upriver to document possible slides, footprints and nests. Crocodilian sampling took place during the night from 2100-300 respectively. Crocodilian eye-shines were spotted

using a Rayovac© 6619-0702 Krypton Headlight and captured using a noose of iron-wire at the end of a 1-2 m long PVC pipe. Every crocodilian sampled was physically marked by the removal of a specific tail scute. Location, sex, body length, tail length, body circumference and skull measurements were recorded and a blood or tissue sample was taken for later DNA analysis. Handling usually lasted less than 10 minutes. Captures were released from the exact point they were collected from. Tissues collected were stored in 95% ethanol and blood was stored in a blood storage buffer (Longmire et al. 1991).





Field site: Playa Brava

RESULTS

Over the course of two weeks, 29 wild American crocodiles were captured and sampled (Table 1), the majority of which being juveniles less than 1m long. We surveyed as far inland as 5 km on some river systems. Most adults sampled were females found less than 1 km from a river mouth. A juvenile 100 cm long was captured and sampled approximately 4 km upstream from the river mouth. This individual was the furthest inland a crocodilian was seen. The largest

crocodile sampled was a dominant male at the ANAM station nicknamed “Tito”, total length was measured at 3 m. No caimans were sampled let alone seen during the extent of the exploration.

Table 1. Crocodilian samples per river locality on Coiba Island.

River Name	*Crocodylus acutus* (*n*)	*Caiman crocodilus* (*n*)
Playa Hermosa	4	0
Playa Brava	8	0
Santa Cruz	4	0
Cattival	8	0
San Juan	4	0
ANAM	1	0
Total	29	0





***C. acutus* “Tito”**

DISCUSSION

Coiba Island is a protected nature reserve under the supervision of the Panamanian government. The *C. acutus* population is healthy and self-sustaining. Without the constraints of anthropogenic pressure, crocodiles are allowed to reach their full size and evidence existed of yearly reproduction. Oppositely, any caiman population was not present or at least not detected. Consequently any population genetics study on Coiba could not be attempted.

The question that immediately arises is why are there not caimans on the island? There is no place on the island further than 8 km away from the nearest coast. There are no large lagoons on the island, estuaries are relatively small and the largest river on the island is only 23 km long. *Crocodylus acutus* and *C. crocodilus* are sympatric with one another in Central America, yet little is published about how *C. acutus* and *C. crocodilus* interact with one another. It is believed salt water bodies are barriers to gene flow in Alligatorids (Brochu 2001; Vasconcelos et al. 2006). Thus, it is possible that caiman was a part of the fauna of Coiba before the land bridge was flooded after the most recent ice age around 10,000 years ago. But through competition with *C. acutus,* caiman were extirpated from the island and never repopulated.

On the rivers sampled, no evidence of Caiman existed, no slides, nests etc, so why is caiman reported to exist? To an untrained observer, a juvenile crocodile and a caiman look very similar to one another. Without a close examination of the specimen, one could easily misidentify crocodiles as caiman as we think happened. Without physical evidence in the form of a photograph, tissue sample or whole specimen, we can only suspect this was the case for the misreports of caiman on Coiba Island. Subsequent visits to Coiba Island have yielded the same results regarding the absence of caiman, yet we must note the entire island has not sampled so it remains possible caiman could exist on the south west side of the island as this area is rarely visited by ANAM rangers or tourists (Venegas-Anaya, personal communication). It is unfortunate a population of caiman could not be analyzed. We believe their presence could have provided some interesting insight into the history of the island and into the natural history of caiman.





Evidence of *C. acutus* reproduction on Coiba

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